ONTARIO MINISTRY OF ENVIRONMENT
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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1965

GODERICH

water treatment plant

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DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

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1965

Goderich water treatment plant
: annual report 1965.

82291

ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

Members of the Goderich Local Advisory Committee,
Town of Goderich.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Goderich Water Treatment Plant, OWRC Project No. 60-W-69.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water treatment.

Yours very truly,

D. S. Caverly,
General Manager.

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ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET
TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Goderich Water Treatment Plant, OWRC Project No. 60-W-69.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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GODERICH

water treatment plant

operated for

THE TOWN OF GODERICH

by

THE ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

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D. A. Moodie
H. E. Brown
L. E. Venchiarutti

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ASSISTANT GENERAL MANAGERS

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F. A. Voege
K. H. Sharpe
A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: P. J. Osmond

801 Bay Street Toronto 5

'65 REVIEW

The average daily flow of 0.775 million gallons was less than the average daily flow in 1964 of 0.805 million gallons. In 1963 the average was still higher, being 0.835 MGD. The decrease in 1965 over 1964 was probably due to the poor weather during the summer months. In 1964, lawn watering restrictions probably reduced the flows from the higher 1963 values.

TREATED WATER QUALITY

The treated water quality was excellent throughout the year and met OWRC standards at all times.

RAW WATER QUALITY

The quality of the raw water was similar to that in 1963 and better than in 1964. On several occasions, however, adverse lake currents combined with high river flows created a high turbidity condition, as well as increasing the chlorine demand.

COST

The operating costs were in proportion to the type and capacity of the plant.

PLANT

The staff maintained a clean, attractive and efficient plant for the Town of Goderich, special attention was given to good public relations and many visitors, particularly of school age, visited the plant during the year.

GLOSSARY

BTU	British Thermal Unit
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpm	gallons per minute
lin. ft.	linear feet
mgd	million gallons per day
pH	a symbol for hydrogen-ion concentration; a pH test determines the intensity of the acidity or alkalinity of a water
ppm	parts per million
ss	suspended solids
SWD	side wall depth
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)
turbidity	a measurement of the amount of visible material in suspension in water

HISTORY

1960 - 1965

INCEPTION

In 1960, the Town of Goderich and the Ontario Water Resources Commission initiated plans for the construction of a modern water treatment plant.

The firm of James F. MacLaren Limited, Toronto, Consulting Engineers, was engaged to prepare plans and specifications for the project.

APPROVAL

In May 1960, the town signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the plant.

CONSTRUCTION

In early 1962, Bedford Construction Limited, began construction and by November 16, 1962, the Division of Plant Operations took over the operation.

TOTAL COST

$1,001,524.52

Project Staff

M. Wilkinson
Chief Operator

Assistant Chief Operator:	M. McKee
Operators:	M. McAdam G. Nelson M. Sheardown

COMMENTS

The plant is supervised 24 hours per day, seven days per week, with each man working a 40 hour week. The permanent staff of five is supplemented by casual labour during periods of vacation, sick leave and heavy work load periods.

The chief operator, Mr. Wilkinson, attended the AWWA Canadian Section convention held in Halifax during May and the OWRC sponsored chief operators conference in April.

DESCRIPTION

INTAKE

The intake works consist of a rock-filled timber crib with cover plate and 1,606 feet of 30 inch diameter intake main. At the crib, the water depth ranges from 16.16 feet to 22.36 feet between minimum and maximum lake levels. Raw water is fed to the screen chamber or can be by-passed directly to the low lift pumping well.

SCREENING

Water is screened through a Link Belt type Model No. 45A Thruflow, travelling water screen with clear openings of 3/8 inch. The screen is normally operated manually but is fitted for automatic starting at 2 inch differential and to sound an alarm at 4 inch differential.

LOW LIFT PUMPING

The low lift pumping well is divided into two compartments. The larger compartment has a volume of 1,880 cubic feet and can act for two low lift pumps. One pump is rated at 1.25 US MGD at 28 feet T.D.H. and the other is rated at 0.75 US MGD at the same head. The second compartment has a volume of 800 cubic feet. Water is pumped from this compartment by a pump rated at 1.25 MGD at 28 feet T.D.H.

All pumps are vertical, turbine type, centrifugal, electric driven pumps (Layne & Bowler). A diesel generator set is used to supply electricity throughout the entire plant in event of electric failure.

Low lift pump delivery is directly to the flash mixing chamber. A Venturi meter is inserted into this line for recording flow.

FLASH MIXING CHAMBER

Liquid or dry chemicals such as alum are mixed with raw water in the flash mixing chamber. It has a volume of 500 cubic feet which provides a detention period of 6.0 minutes at 0.75 MGD, 3.6 minutes at 1.25 MGD and 2.75 minutes at 2.0 MGD. One flash mixer unit (Link Belt No. 30) is installed in the flash mixing chamber. Water flows by gravity from the flash mixing chamber through a flume to the flocculating tanks.

FLOCCULATING TANKS

There are two flocculating tanks. Each tank has a volume of 4760 cubic feet. They provide a detention period of 114 minutes at 0.75 MGD, 57 minutes at 1.5 MGD and 42.6 minutes at 2.0 MGD.

OF PROJECT

Each tank is equipped with a Stuart-Carter (Ball Bearing) "Walking beam" type flocculator mechanism which has inverted V-type paddles moving straight up and down. From the flocculation tanks, the water overflows a submerged weir into the settling tanks.

SETTLING TANKS

There are four settling tanks that operate in parallel. Each tank has a volume of 4,790 cubic feet. They provide a detention period of 3.82 hours at 0.75 MGD, 1.91 hours at 1.5 MGD, and 1.43 hours at 2.0 MGD. Sludge is scraped manually to a hopper fitted with an outlet mud valve at the upstream end of the tanks and is discharged through a 10 inch diameter pipe to the common plant sewer system which runs directly to the lake. At the downstream end of the tanks, water flows over four submerged weirs into a common header flume and thence to the surface of the sand filters.

SAND FILTERS

There are four rapid sand filters. Each has a surface of 144 square feet providing a total surface area of 576 square feet. The filtration rate at 1.5 MGD is equal to 2.16 US GPM/sq. ft. and at 2.0 MGD is equal to 2.9 USPGM/sq. ft. Each filter is equipped with rotary surface agitators.

Water for backwashing the filters is pumped from the high lift pump well by one Layne and Bowler electric drive vertical turbine pump rated at 4,165 US GPM at 40 feet T.D.H. Backwash waste discharges to the plant sewer system. Filtered water is run to a clear well.

CLEAR WELL

The clear well consist of two interconnected sections located beneath the settling tanks and filters. Including the high lift pump well, the clear well capacity is around 20,800 cubic feet. Post-chlorination is provided at the clear well.

HIGH LIFT PUMPING

Filtered water flows through a 24 inch diameter bottom outlet pipe from the clear well to the high lift pump wells. These pumps are arranged in a similar fashion to those used in the low lift well with pumps rated at the same flows (i.e. two at 1.25 US MGD and one at 0.75 US MGD). The high lift pumps feed through a common header directly into the distribution system. Flow to the distribution system is also metered.

PROJECT COSTS

NET CAPITAL COST (Final):

Goderich Town	$710,573.63		
Deduct payments from municipality	15,000.00	$695,573.63	
Ontario Hospital	$290,950.89		
Deduct payments from Ontario Hospital	298,342.87	7,391.98 Cr.	
LONG TERM DEBT TO OWRC			$688,181.65

Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965:

Goderich Town	46,015.34	
Ontario Hospital	-	$ 46,015.34

BILLINGS

The total cost to the municipality during 1965 was as follows:

Net Operating		
Goderich Town	$ 37,914.16	
Ontario Hospital	2,020.70	
		$ 39,934.86
Debt Retirement		
Goderich Town	$ 14,035.00	
Ontario Hospital	-	
		14,035.00
Reserve		
Goderich Town	$ 6,516.89	
Ontario Hospital	347.33	
		6,864.22
Interest Charges		
Goderich Town	$ 39,144.67	
Ontario Hospital	(415.95)CR	
		38,728.72
TOTAL		$ 99,562.80

RESERVE ACCOUNT

Balance at January 1, 1965		
Goderich Town	$12,577.47	
Ontario Hospital	908.66	
		$13,486.13
Deposited by Municipality		
Goderich Town	$ 6,063.16	
Ontario Hospital	298.80	
		6,361.96
Interest Earned		
Goderich Town	$ 833.38	
Ontario Hospital	49.12	
		882.50
		$20,730.59
Less Expenditures		
Goderich Town	$ 737.74	
Ontario Hospital	34.76	
		772.50
Balance at December 31, 1965		
Goderich Town	$18,736.27	
Ontario Hospital	1,221.82	
		$19,958.09

MONTHLY OPERATING COSTS

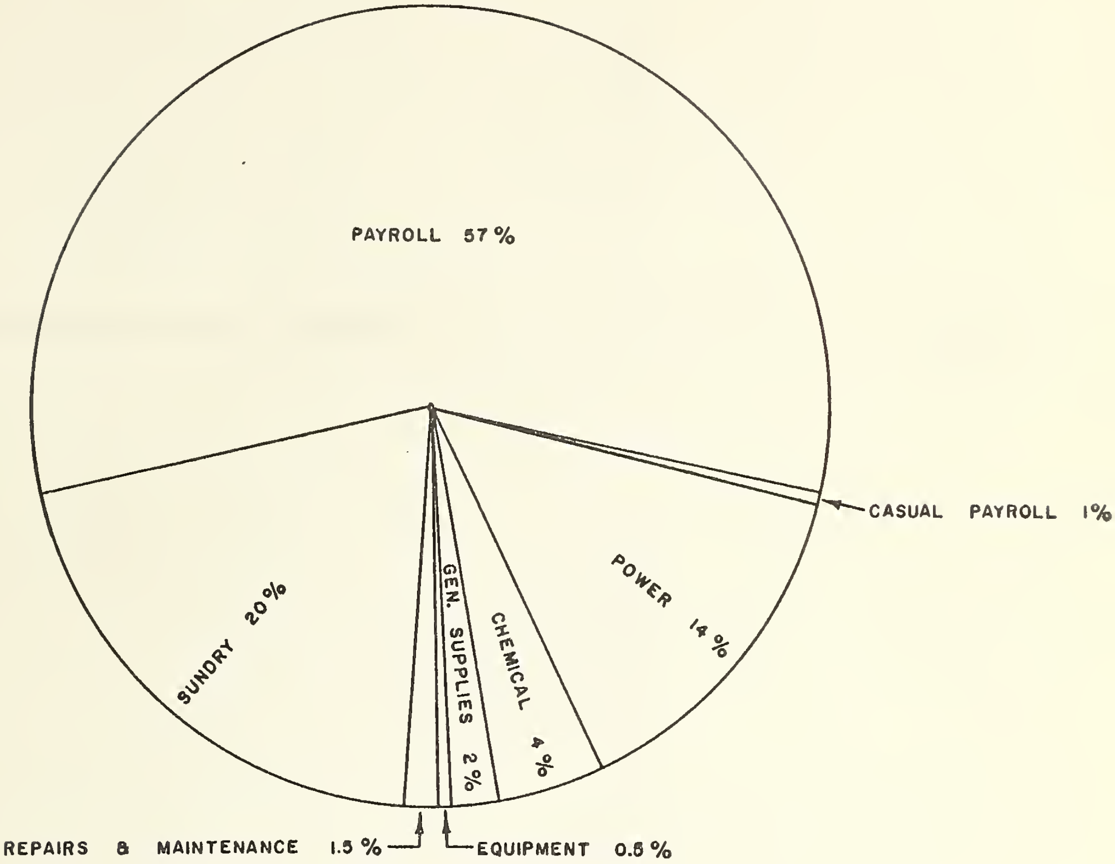
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JAN	2775.85	1610.28		524.08	560.15	51.25		30.09	
FEB	2276.70	1610.28		549.37					117.05
MARCH	2718.43	1823.98		520.09	198.75	119.80	5.36	28.80	21.65
APRIL	2666.04	1877.98		497.28		54.86		88.97	146.95
MAY	3584.99	2545.54		497.61		109.02	153.49	20.76	258.57
JUNE	8404.45	1686.68		434.49	198.75	30.39	37.35	60.83	5955.96
JULY	2375.25	1698.32	84.00	466.05		98.92		1.76	26.20
AUG	2565.40	1813.20	180.00	411.59		61.75		36.78	62.08
SEPT	2279.37	1801.86		397.33		54.83			25.35
OCT	3432.66	2672.49		363.62		58.43	8.61	59.41	270.10
NOV	3728.05	1915.30		418.72	198.75	81.70		2.18	1111.40
DEC	3127.67	1841.20		445.18	557.04	91.77		165.17	27.31
TOTAL	39934.86	22897.11	264.00	5525.41	1713.44	812.72	204.81	494.75	8022.62

YEARLY OPERATING COSTS

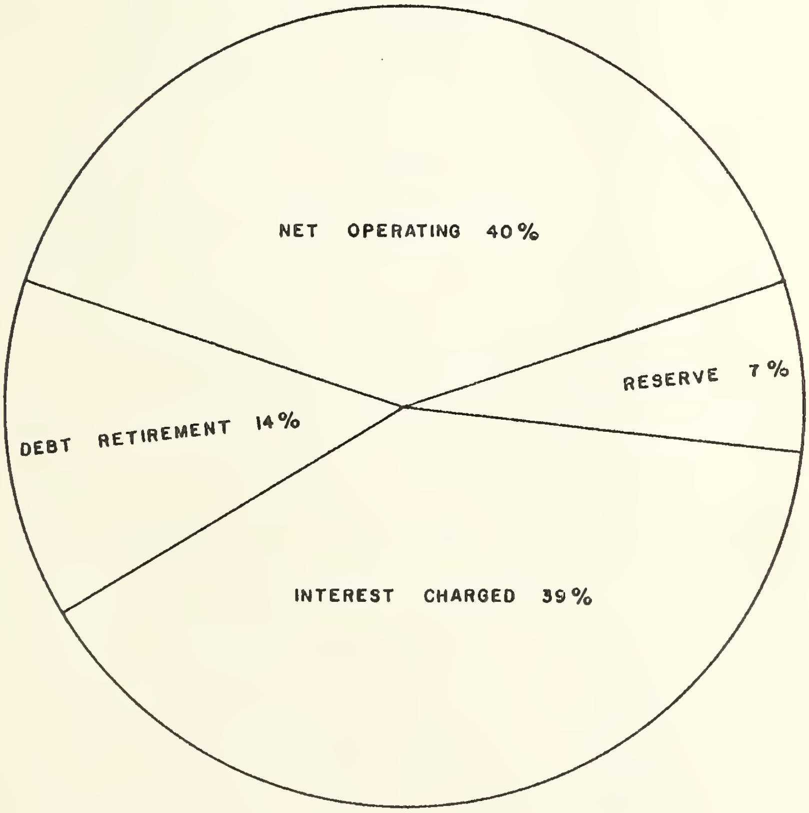
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER THOUSAND GALLONS
1963	305.271	$30,397	* $ 17.82	$ 0.10
1964	293.962	36,979	21.64	0.13
1965	283.003	39,935	23.36	0.14

* BASED ON ESTIMATED ANNUAL POPULATION AND 3.9 PERSONS PER FAMILY

1965 OPERATING COSTS

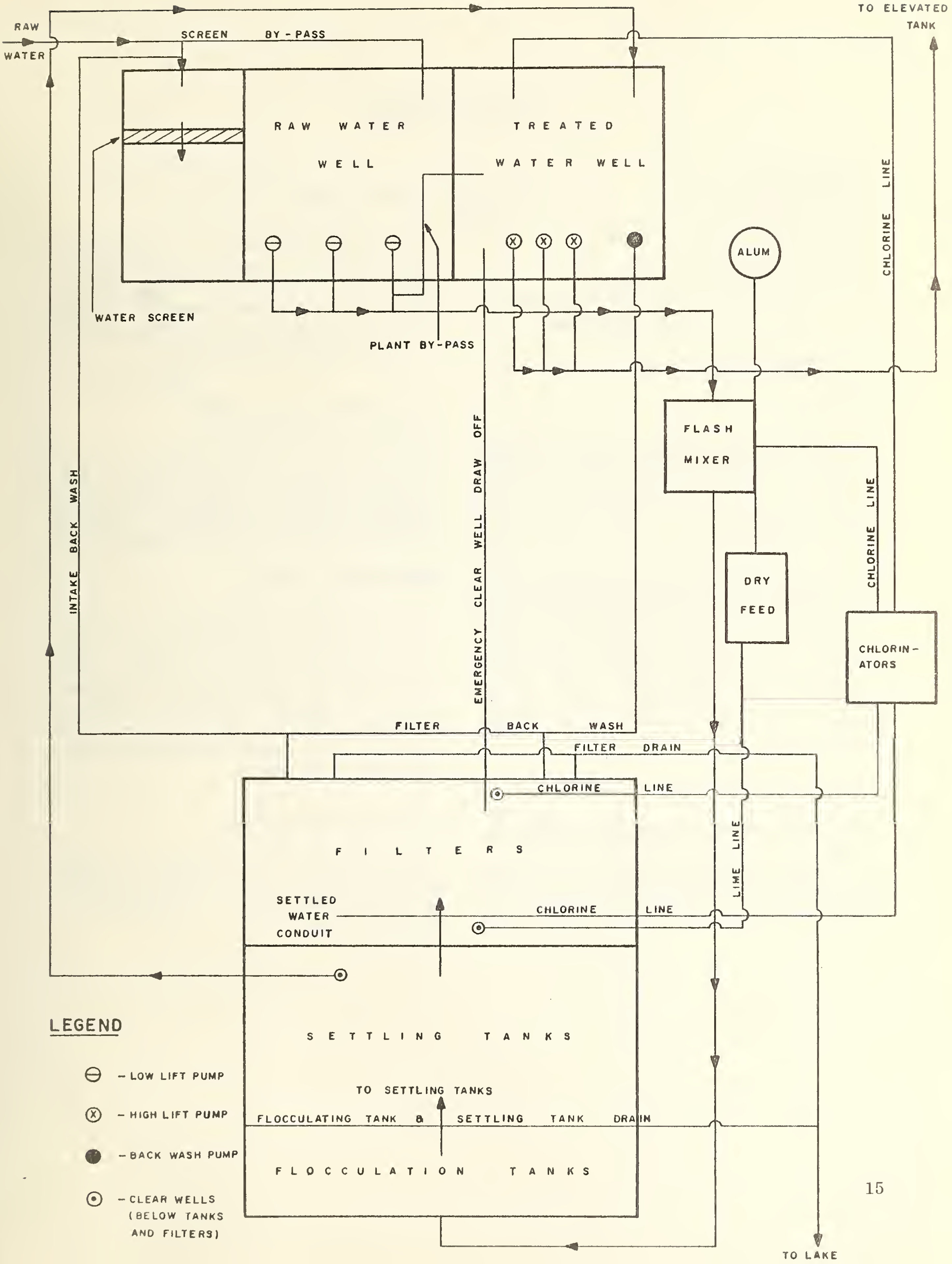


TOTAL ANNUAL COST



Technical Section

FLOW CHART


RAW WATER
SCREEN BY-PASS
TO ELEVATED TANK
RAW WATER WELL
TREATED WATER WELL
ALUM
CHLORINE LINE
WATER SCREEN
PLANT BY-PASS
FLASH MIXER
INTAKE BACK WASH
EMERGENCY CLEAR WELL DRAW OFF
CHLORINE LINE
DRY FEED
CHLORINATORS
FILTER BACK WASH
FILTER DRAIN
CHLORINE LINE
FILTERS
LIME LINE
SETTLED WATER CONDUIT
CHLORINE LINE
SETTLING TANKS
TO SETTLING TANKS
FLOCCULATING TANK & SETTLING TANK DRAIN
FLOCCULATION TANKS
TO LAKE
LEGEND
⊖ – LOW LIFT PUMP
⊗ – HIGH LIFT PUMP
● – BACK WASH PUMP
⊙ – CLEAR WELLS (BELOW TANKS AND FILTERS)

Design-Data

GENERAL

Type of Plant - Rapid sand filter

Design Capacity - 1.5 MGD
2.0 MGD for short periods of time

Source of Water - Lake Huron

INTAKE

One rock filled timber crib with cover plate and 1606 feet of 30 inch diameter main.

SCREENING

One Link-Belt Model No. 45A Thruflow travelling water screen with clear openings of 3/8 inch. The screen is three feet wide and 23 feet deep. Travelling speed is 10 feet per minute. Control will be manual normally. However, it will start automatically with a 2 inch differential. An alarm will ring at a 4 inch differential.

LOW LIFT PUMPING

Two low lift pumps rated at 1.25 MGD and 0.75 MGD at 28 feet T. D. H. in one low lift raw water well. One low lift pump rated at 1.25 MGD at 28 feet T. D. H. in the adjacent raw water well.

FLASH MIXER

Tank dimensions are 7.67 feet square by 8.5 feet deep. Mixer is a Link-Belt No. 30 which is equipped with a 30 inch propellor at a maximum speed of 125 RPM and is powered by a 3 HP Tamper squirrel cage induction motor.

FLOCCULATING TANKS

Two flocculating tanks, each 20.5 feet wide, 14.5 feet long by 15.25 feet average water depth. Walking beam V-type paddles are used. Paddles are constructed of 2 inch by 6 inch cypress wood.

SETTLING TANKS

Four settling tanks, each 61.5 feet long 10.25 feet wide by 7.6 feet deep. Sludge is scraped manually to a hopper fitted with an outlet mud valve at the upstream end of the tanks. Sludge is discharged through a 10 inch diameter pipe to the common plant sewer system which runs directly to the lake.

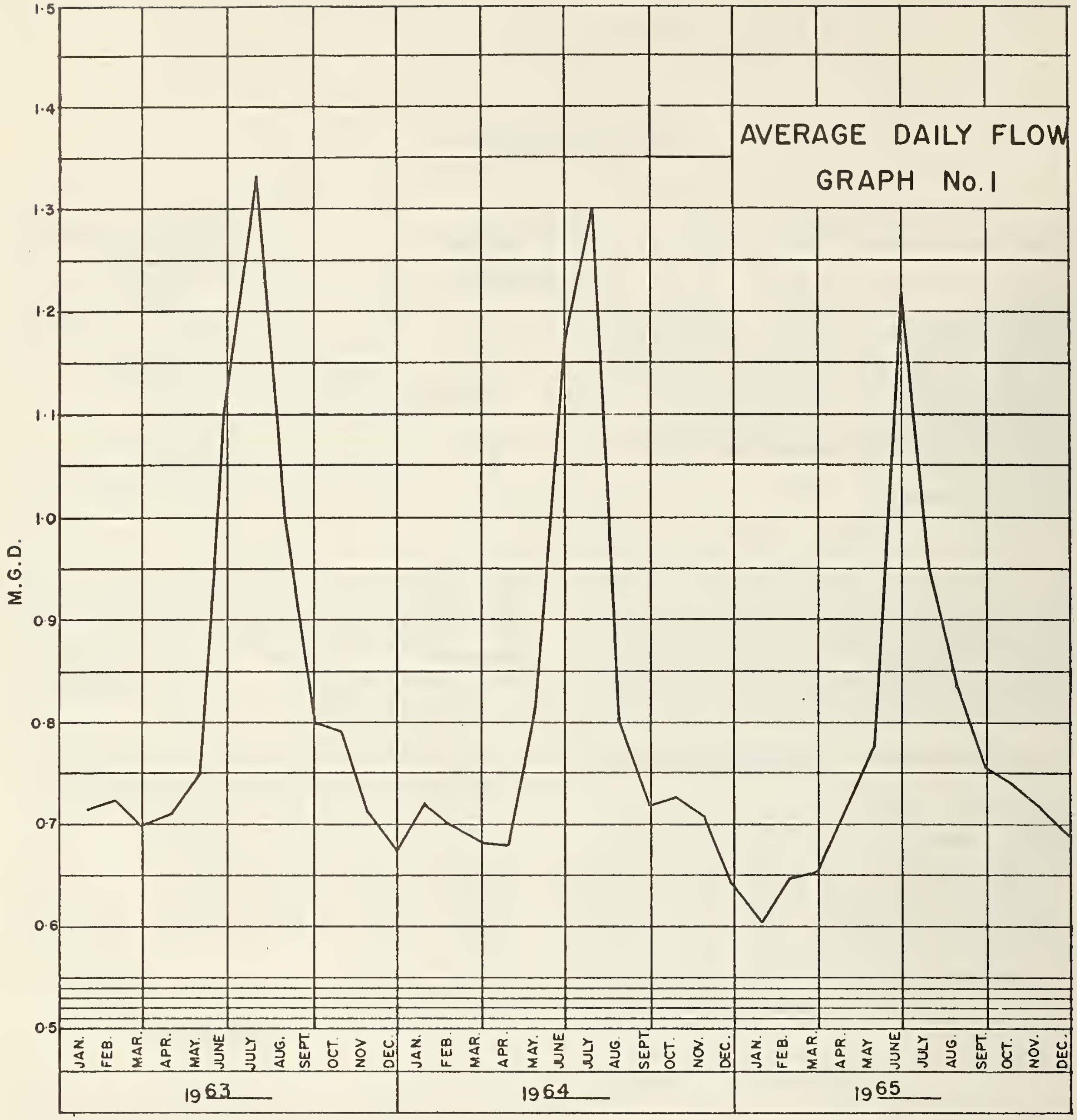
HIGH LIFT PUMPING

High lift pumps are arranged similarly to the low lift pumps. Two pumps rated at 1.25 MGD and one at 0.75 MGD at 28 feet T. D. H.

LAYER DESCRIPTIONS	THICKNESS (inches)	PARTICLE SIZE LIMITS
Sand (top)	24	0.5 to 0.55 MM
Gravel (6th)	5	2" to 1"
Gravel (5th)	2	1" to 1/2"
Gravel (4th)	2	1/2" to 1/4"
Gravel (3rd)	4	1/4" to 1/8"
Gravel (2nd)	2	1/2" to 1/4"
Gravel (bottom)	2	1" to 1/2"

SAND FILTERS

Four units each with surface dimensions of 12 feet by 12 feet. Filter media is arranged according to the above table. The design filtration rate at 1/5 MGD is 2.16 USGPM/square foot. Each filter is supplied with a 4 foot, 11 inch Palmer sweep filter agitator. Filters are of the rapid sand type.



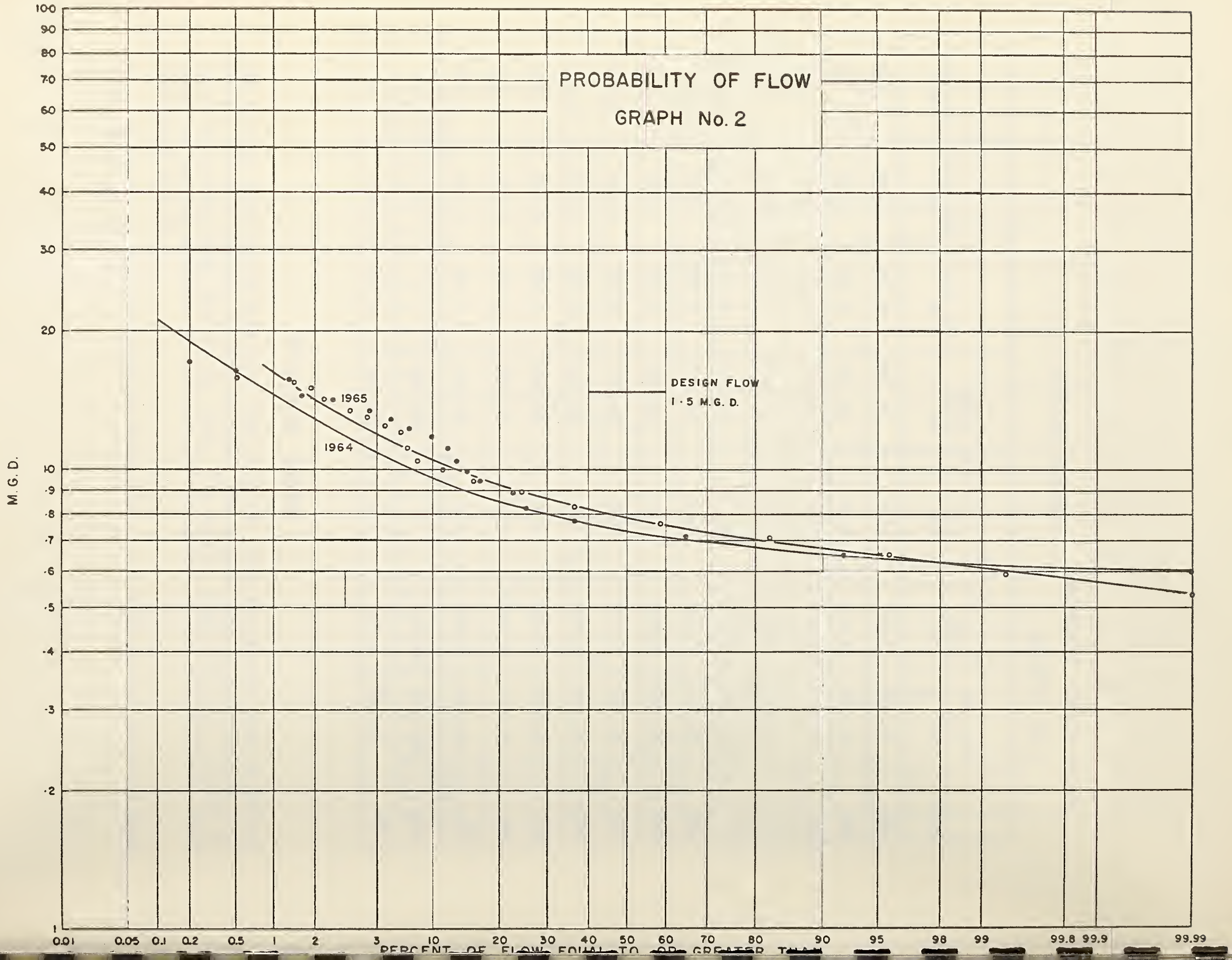
Process Data

The average daily flow is down from 1964 by 3.7%. Also the summer peak is reduced from 1.3 MGD in 1964 to 1.22 MGD in 1965. The summer peak is approximately 1 1/2 times the average daily flow for the year. The notable slight difference between the maximum day and minimum day indicates that the system is very well balanced. Plant load factor is 0.52.

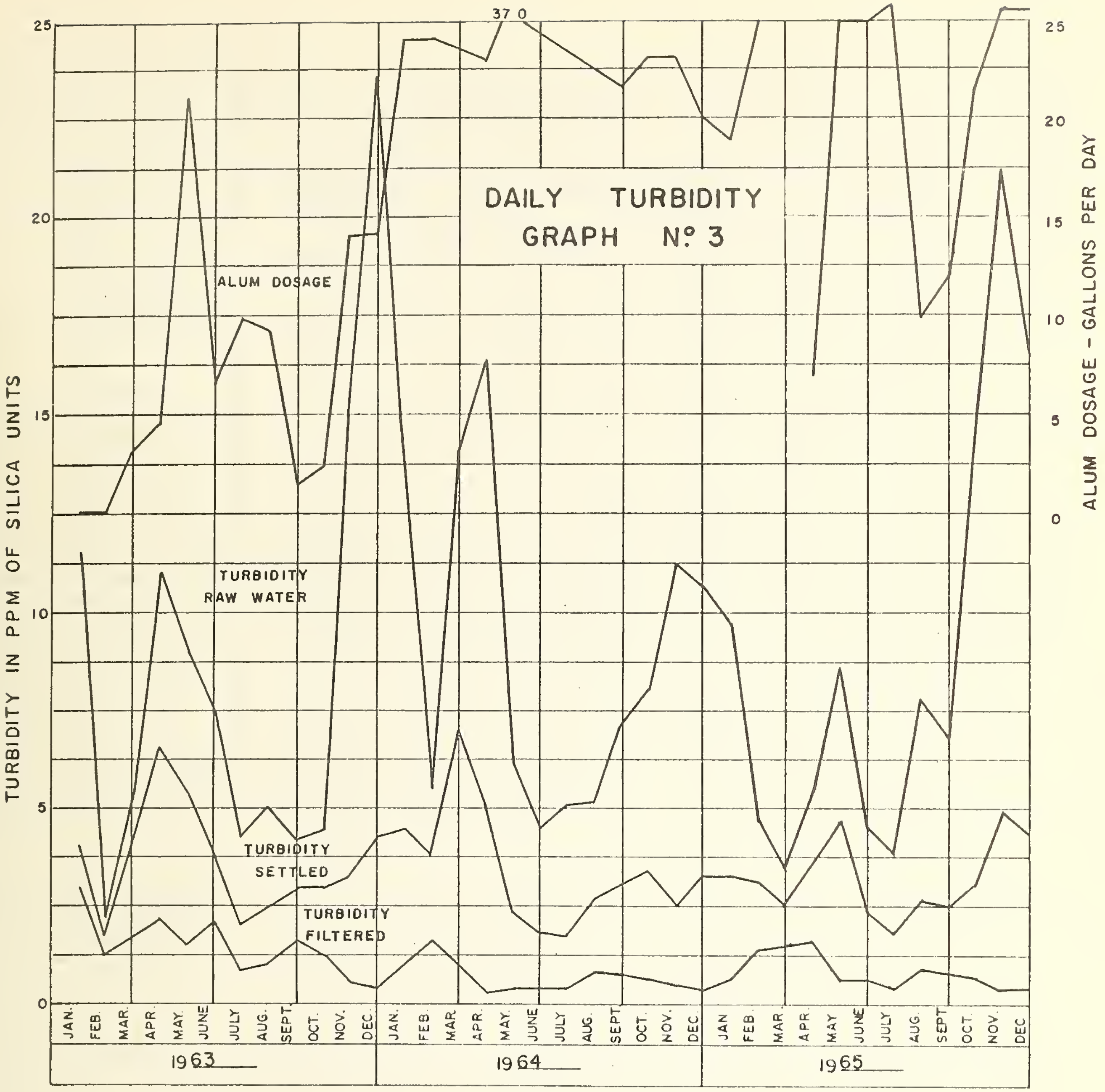
From Graph No. 2, it is shown that the design flow of 1.5 MGD was only exceeded about 1.5 percent of the time.

FLOW DATA

MONTH	TOTAL RAW FLOW MG	BACKWASH		PLANT OUTPUT MG	AVG. DAILY MG	MAX. DAILY MG	MIN. DAILY MG
		TOTAL MG	% OF RAW				
JAN.	21.489	2.697	12.5	18.792	0.606	0.722	0.417
FEB.	21.550	3.412	15.8	18.138	0.648	0.786	0.565
MAR.	24.261	4.035	16.5	20.226	0.652	0.700	0.542
APR.	24.422	2.876	11.8	21.226	0.718	0.868	0.556
MAY	27.518	3.402	12.4	24.116	0.778	0.957	0.668
JUNE	38.948	2.356	6.0	36.592	1.220	1.517	0.630
JULY	30.048	0.620	2.1	29.428	0.949	1.281	0.694
AUG.	26.989	1.173	4.4	25.816	0.833	0.995	0.649
SEPT.	23.359	0.726	3.1	22.633	0.754	1.015	0.655
OCT.	23.078	0.136	0.6	22.942	0.740	0.864	0.634
NOV.	21.647	0.197	0.9	21.450	0.715	0.878	0.620
DEC.	21.708	0.381	1.7	21.327	0.688	0.745	0.620
TOTAL	305.017	22.011	-	283.006	-	-	-
AVG.	25.418	1.834	7.2	23.584	0.775	-	-



PROBABILITY OF FLOW
GRAPH No. 2



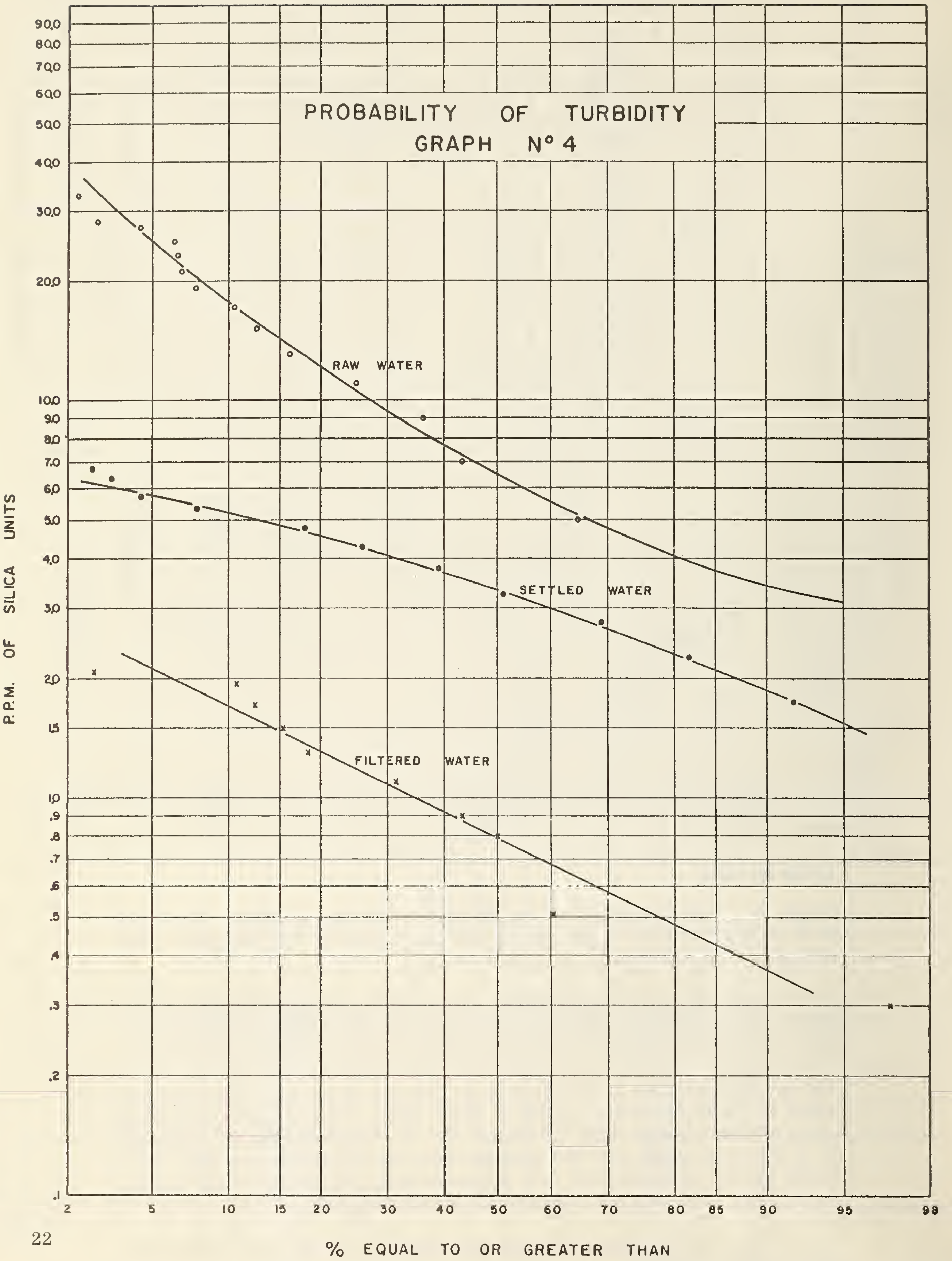
COMMENTS

Graph No. 3 shows turbidities for the years 1963 through 1965. The trend is to high turbidities in the spring and low values in the summer. The turbidity is affected by the Maitland River.

In 1964 the raw water turbidity averaged higher than in either 1963 or 1964. During 1965, the turbidity exceeded 7.0 ppm of silica units 45 percent of the time whereas in 1964, it had been exceeded 65% of the time.

The general practice is to add alum to the raw water whenever the raw water turbidity exceeds 7.0 ppm of silica units. This is reflected in the average alum dosage curve on Graph No. 3. Alum was used an average of 17 days per month and the average dose was 31 gallons per day. Normally this is equivalent to 1 1/4 grains of alum per gallon of raw water. As in 1964, lime was not required for pH adjustment.

The filtered product turbidity was always below the recommended maximum value of 5 ppm.


PROBABILITY OF TURBIDITY
GRAPH N° 4
RAW WATER
SETTLED WATER
FILTERED WATER
P.P.M. OF SILICA UNITS
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.5
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% EQUAL TO OR GREATER THAN

CHLORINATION

MONTH	PLANT FLOW MG	DOSAGE RATES (PPM) PRE CHLORINATION	DOSAGE RATES (PPM) POST CHLORINATION	TOTAL POUNDS CHL.
JANUARY	18.792	0.99	0.34	267.1
FEBRUARY	18.138	1.19	0.53	379.0
MARCH	20.223	1.10	0.47	369.2
APRIL	21.546	1.06	0.51	377.3
MAY	24.116	0.84	0.36	306.5
JUNE	36.592	0.71	0.21	335.9
JULY	29.428	0.90	0.20	322.9
AUGUST	25.816	1.03	0.23	325.7
SEPTEMBER	22.633	1.14	0.25	323.6
OCTOBER	22.942	1.39	0.19	375.9
NOVEMBER	21.450	1.30	0.15	318.6
DECEMBER	21.327	1.09	0.12	264.4
TOTAL	283.003	12.74	3.56	3966.1
AVERAGE	23.584	1.06	0.30	330.5

COMMENTS

Pre-chlorination of the raw water in 1965 registered a dosage rate of 1.06 ppm to maintain a 0.2 ppm residual. This is slightly higher than in 1964. Post-chlorination dosage averaged 0.3 ppm to produce residuals from 0.3 to 0.5 ppm. Post-chlorination dosage is less than the residual due to a carry over of pre-chlorine.

CONCLUSIONS

The treated water quality was excellent throughout the year and met OWRC standards at all times. Difficulties were not encountered during the year in supplying an adequate volume of treated water to the distribution system except during periods of heavy lawn watering. Watering restrictions in the form of staggered hours relieved this problem.

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1965

Goderich water treatment plant
: annual report 1965.
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ONTARIO WATER RESOURCES COMMISSION